10/031690 .053102

JC07 Rec'd PCT/PTO 22 JAN 2002

Form PTO-1390 (Rev. 12-29-99) US DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NO. H 4043 PCT/US
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		U.S. APPLICATION NO. (if known, see 37 CFR 1.5) 10/031690
INTERNATIONAL APPLICATION NO. PCT/EP00/06736	INTERNATIONAL FILING DATE July 14, 2000	PRIORITY DATE CLAIMED July 23, 1999

TITLE OF INVENTION
AQUEOUS FUEL MIXTURE

APPLICANT(S) FOR DO/EO/US
Frank Bongardt, Juergen Roeder, Lothar Carl

Applicant herewith submits to the United States Designated/Elected Office (EO/DO/US) the following items and other information:

1. ■ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39 (1).
4. ■ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ■ A copy of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ■ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ■ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ■ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ■ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ■ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). **(UNEXECUTED)**
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ■ A FIRST preliminary amendment
    ☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☐ Other items or information:

"Express Mail Post Office to Addressee" service Mailing Label Number EL541614466US .

10/031690 .053102

531 Rec'd PCT/PTO 22 JAN 2002

U.S. Application No. (If known, see 37 CFR 1.5) 10/031690	INTERNATIONAL APPLICATION NO. PCT/EP00/06736	ATTORNEY'S DOCKET NUMBER H 4043 PCT/US

17. ■ The following fees are submitted:

	CALCULATIONS	PTO USE ONLY
BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)):		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO..... **$1,040.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO..... **$890.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37CFR 1.445(a)(2)) paid to USPTO **$740.00**		
International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) **$710.00**		
International preliminary examination fee paid to USPTO (37CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4)..... **$100.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 890	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date 37 (CFR 1.492(e)).	$ 0	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total Claims	20 - 20 =	0	0 X $18.00	$ 0	
Independent Claims	3 - 3 =	0	0 X $84.00	$ 0	
Multiple dependent claims (s)(if applicable)		0	+ $280.00	$ 0	
TOTAL OF ABOVE CALCULATIONS =				$ 890	
Reduction of ½ for filing by small entity, if applicable. A Small Entity Statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).				$ 0	
SUBTOTAL =				$ 890	
Processing fee of **$130.00** for furnishing the English translation later the ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$ 0	
TOTAL NATIONAL FEE =				$ 890	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). $40.00 per property +				$ 0	
TOTAL FEES ENCLOSED =				$ 890	
				Amount to be: refunded:	$----------
				charged:	$890.00

a. ☐ A check in the amount of $_____ to cover the above fees is enclosed.

b. ■ Please charge my Deposit Account No. 50-1177 in the amount of $890.00 to cover the above fees. A triplicate copy of this sheet is enclosed. Order No. 02-0042.

c. ■ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 50-1177. A triplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO: Cognis Corporation, Law Dept.
2500 Renaissance Blvd., Suite 200
Gulph Mills, PA 19406

SIGNATURE:

Aaron R. Ettelman
NAME ATTORNEY FOR APPLICANT

42,516
REGISTRATION NUMBER

"Express Mail " Mailing Label Number EL541614466US .

PATENT
Docket No. H 4043 PCT/US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

RE: PCT/EP00/06736
International Filing Date: July 14, 2000
Priority Date Claimed: July 23, 1999
Applicant: Bongardt, et al.
Title: AQUEOUS FUEL MIXTURE
Applicants' Reference: H 4043 PCT/US

PRELIMINARY AMENDMENT

Commissioner for Patents
Box PCT
Washington, DC 20231

ATTN: DO/EO/US

Prior to the calculation of fees and examination of the above-identified national stage application pursuant to the accompanying submission under 35 U.S.C. §371, please amend the English translation of the International Application submitted herewith, without prejudice, as follows:

In the Specification:

Please amend the instant Specification, without prejudice, as follows:

Please delete all text above line 1 of page 1, and replace the deleted matter with the following new section headings and title of the invention:

--TITLE OF THE INVENTION

Branched-Chain and Ethoxylated Fatty Alcohol Emulsifier Mixtures,
and Methods of Using the Same in Aqueous Fuels

BACKGROUND OF THE INVENTION--

At page 2, between lines 13 and 14, please insert the following new section heading:

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--BRIEF SUMMARY OF THE INVENTION--

At page 3, between lines 13 and 14, please insert the following new section heading:

--DETAILED DESCRIPTION OF THE INVENTION--

At page 7, between lines 1 and 2, please add the following new paragraph: --What is claimed is:--.

On a separate, new page 9, please add the following new section heading and paragraph containing an Abstract of the Disclosure:

--ABSTRACT OF THE DISCLOSURE

Water-free, fuel-additive concentrates containing a branched-chain fatty alcohol having from 12 to 24 carbon atoms, and an ethoxylated fatty alcohol having from 8 to 24 carbon atoms and from 1 to 10 moles of ethylene oxide per mole of alcohol, are described. Methods of emulsifying aqueous fuels and fuel mixtures containing such emulsifiers are also described.--

In the Claims:

Please add new claims 14-33, as follows:

--14. (New) A composition comprising: (a) a fuel, (b) water, and (c) an emulsifier, wherein the emulsifier comprises a mixture of (i) a branched-chain fatty alcohol having from 12 to 24 carbon atoms, and (ii) an ethoxylated fatty alcohol having from 8 to 24 carbon atoms and from 1 to 10 moles of ethylene oxide per mole of alcohol.--

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--15. (New) The composition according to claim 14, wherein the mixture is present in an amount of from 0.01 to 5% by weight based on the combined weight of the fuel and the water.--

--16. (New) The composition according to claim 14, wherein the mixture is present in an amount of from 0.01 to 2% by weight based on the combined weight of the fuel and the water.--

--17. (New) The composition according to claim 14, wherein the mixture is present in an amount of from 0.01 to 1% by weight based on the combined weight of the fuel and the water.--

--18. (New) The composition according to claim 14, wherein the fuel is present in an amount of from 60 to 95% by weight, the water is present in an amount of from 5 to 35% by weight, and the mixture is present in an amount of from 0.01 to 5% by weight, based on the weight of the composition.--

--19. (New) The composition according to claim 18, further comprising one or more additives present in an amount of from 0.01 to 2.5%, based on the weight of the composition.--

--20. (New) The composition according to claim 14, further comprising one or more additives present in an amount of from 0.01 to 0.5% by weight, wherein the fuel is present in an amount of from 65 to 90% by weight, the water is present in an amount of from 25 to 35% by weight, and the mixture is present in an amount of from 0.01 to 0.5% by weight, all weight percents based on the weight of the composition.--

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--21. (New) The composition according to claim 14, wherein the branched-chain fatty alcohol and the ethoxylated fatty alcohol are present in a weight ratio of from 1:1 to 1:4.--

--22. (New) The composition according to claim 14, wherein the branched-chain fatty alcohol comprises an alcohol branched in the α-position.--

--23. (New) The composition according to claim 14, wherein the branched-chain fatty alcohol comprises at least one alcohol selected from the group consisting of isotridecyl alcohol, isohexadecyl alcohol, isostearyl alcohol, 2-hexyl-1-decanol, and 2-octyl-1-decanol.--

--24. (New) The composition according to claim 14, wherein the branched-chain fatty alcohol has from 14 to 24 carbon atoms.--

--25. (New) The composition according to claim 14, wherein the ethoxylated fatty alcohol comprises an alcohol having from 12 to 18 carbon atoms and from 1 to 4 moles of ethylene oxide per mole of alcohol.--

--26. (New) The composition according to claim 14, wherein the fuel comprises diesel oil.--

--27. (New) A composition comprising: (a) a diesel oil, (b) water, and (c) an emulsifier, wherein the emulsifier comprises a mixture of (i) an α-branched-chain fatty alcohol having from 14 to 24 carbon atoms, and (ii) an ethoxylated fatty alcohol having from 12 to 18 carbon atoms and from 1 to 4 moles of ethylene oxide per mole of alcohol; wherein the diesel oil is present in an amount of from 60 to 95% by weight, the water is present in an amount of from 5 to 35% by weight, and the mixture is present in an amount of from 0.01 to 5% by weight, based on the weight of the composition.--

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--28. (New) A water-free, fuel-additive concentrate comprising: (a) a branched-chain fatty alcohol having from 12 to 24 carbon atoms, and (b) an ethoxylated fatty alcohol having from 8 to 24 carbon atoms and from 1 to 10 moles of ethylene oxide per mole of alcohol.--

--29. (New) The concentrate according to claim 28, further comprising a corrosion inhibitor.--

--30. (New) The concentrate according to claim 29, wherein the corrosion inhibitor comprises an ethoxylated carboxylic acid amide.--

--31. (New) The concentrate according to claim 29, wherein the branched-chain fatty alcohol is present in an amount of from 10 to 30% by weight, the ethoxylated fatty alcohol is present in an amount of from 30 to 60% by weight, and the corrosion inhibitor is present in an amount of from 15 to 30% by weight, based on the weight of the concentrate.--

--32. (New) The concentrate according to claim 30, wherein the branched-chain fatty alcohol is present in an amount of from 10 to 30% by weight, the ethoxylated fatty alcohol is present in an amount of from 30 to 60% by weight, and the corrosion inhibitor is present in an amount of from 15 to 30% by weight, based on the weight of the concentrate.--

--33. (New) A method of emulsifying a fuel and water, said method comprising:

(a) providing an aqueous fuel;

(b) providing the water-free, fuel-additive concentrate according to claim 28; and

(c) mixing the aqueous fuel and the water-free, fuel-additive concentrate.--

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Please cancel claims 1-13, without prejudice.

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REMARKS

Claims 14-33 are currently pending in the instant application.

The Specification has been amended to delete the original section headings and to insert the preferred section headings pursuant to 37 C.F.R. §1.77. A new Title of the Invention has been inserted. An Abstract of the Disclosure, in accordance with the disclosure, has been added. It is submitted that the amendments to the Specification made herein introduce no new matter. All of the amendments to the Specification constitute deletions of original section headings and/or paragraphs, and insertions or additions of new section headings and/or paragraphs. Accordingly, pursuant to 37 C.F.R. §1.121(b)(1)(iii), no separate page captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE" is necessary. A separate page containing a clean copy of the Abstract of the Disclosure has been attached for the Examiner's convenience. Entry of the amendments to the Specification made herein are therefore proper and respectfully requested.

Original claims 1-13 have been canceled and replaced with new claims 14-33 solely for the purpose of improving clarity and grammar, which may suffer in translation, and not for any reason which relates to the statutory requirements for a patent. New claims 14-33 have not been added in response to any rejection, nor in anticipation of any rejection. Applicants respectfully submit that the scope of new claims 14-33 generally corresponds to the scope of original claims 1-13, and that new claims 14-33 are no narrower than original claims 1-13. Furthermore, although a moot point in view of their cancellation, Applicants respectfully submit that original claims 1-13 satisfied the requirements of 35 U.S.C. §112, as filed. New claims 14-33 are supported by the claims as originally filed and in the Specification, for example, at page 2, lines 14-27; at page 3, line 14, through page 4, line 17; and in the Examples. No new matter has been introduced. All of the amendments to the Claims constitute cancellation of original claims and the addition of new claims. Accordingly, pursuant to 37 C.F.R. §1.121(c)(1)(ii), no separate page captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE" is necessary. Entry is therefore proper and respectfully requested.

Preliminary Amendment of U.S. National Stage for International Application PCT/EP00/06736 filed July 14, 2000

Prompt examination of the instant application in view of the amendments made herein is respectfully requested.

Respectfully submitted,

FRANK BONGARDT, *et al.*

January 22, 2002
(Date)

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ABSTRACT OF THE DISCLOSURE

Water-free, fuel-additive concentrates containing a branched-chain fatty alcohol having from 12 to 24 carbon atoms, and an ethoxylated fatty alcohol having from 8 to 24 carbon atoms and from 1 to 10 moles of ethylene oxide per mole of alcohol, are described. Methods of emulsifying aqueous fuels and fuel mixtures containing such emulsifiers are also described.

Aqueous Fuel Mixture

Internal combustion engines powered by combustible hydrocarbons cause system-related emissions in the form of nitrogen oxides, carbon monoxide and dioxide and particulates. Accordingly, the requirements which the emission levels of internal combustion engines are expected to satisfy have continuously increased in stringency in recent years. This applies not only to engines for motor vehicles of all kinds, but also to stationary units, for example the diesel engines used as generators or block power stations. In the Federal Republic of Germany, emission levels are regulated by the **"Technische Annleitung Luft (TA Luft)"** which stipulates NO_x limits of at most 2,000 mg/m^3 and limits for particulates of at most 130 mg/m^3 for stationary diesel units. These limits are to be lowered even further in the future, NO_x limits of 1,000 mg/m^3 and limits for particulates of 50 mg/m^3 being planned.

Accordingly, there is a considerable demand for emission-reducing measures in the affected industry. It has been known for some time that the addition of water to the fuel during its combustion considerably reduces NO_x, particulates and CO levels. However, water dissolves only sparingly in hydrocarbons. For example, only about 5% by weight of water dissolves in diesel oil, phase separation occurring with larger amounts. Accordingly, if relatively high percentages of water are to be formulated with hydrocarbons, suitable emulsifier systems have to be used. **DE-A 28 54 540** describes water-containing fuels comprising an emulsifier combination of alcohols and addition of products of ethylene oxide or propylene oxide onto C_{9-21} carboxylic acid amides. The emulsifiers are present in quantities of 0.5 to 26% by weight. C_{1-8} alcohols are disclosed as the alcohols. **DE 37 09 195 A1** describes storable water-containing fuel compositions which, besides hydrocarbons, contain a combination of 1.0 to 3.5% by weight of

an emuslifier and 0.5 to 10% by weight of C_{1-8} alcohols. **WO 85/04183** proposes water-based fuels containing 0.5 to 3.0% by weight of ethyoxylated C_{12-14} fatty alcohols as emulsifiers, the document in question failing to disclose the exact degree of ethoxylation.

However, the proposed water-containing fuels on the one hand are unable to satisfy the increased requirements the emission levels are expected to meet; on the other hand, the presence of emulsifiers can lead to engine problems, for example to the formation of deposits in and around the injectors or valves.

Accordingly, the problem addressed by the invention was to provide water-containing fuel systems that would not have any of the disadvantages mentioned above. It has been found that this problem can be solved by the choice of certain emulsifier systems.

In a first embodiment, the present invention relates to a fuel mixture for internal combustion engines containing fuels, water and emulsifiers and optionally other additives, the emulsifier being a mixture of (A) branched-chain, saturated or unsaturated C_{12-24} fatty alcohols and (B) ethoxylated C_{8-24} fatty alcohols containing 1 to 10 mol ethylene oxide per mol fatty alcohol. It has surprisingly been found that this combination of emulsifiers enables fuels and water to be emulsified effectively and very quickly. The quantities of emulsifier used can be well below the known quantities. The fuel mixtures according to the invention preferably contain 60 to 95% by weight of the fuel, 5 to 35% by weight of water, 0.01 to 5% by weight of emulsifiers (A) and (B) and 0 to 2.5% by weight of other additives. Particularly preferred fuel mixtures contain 65 to 90% by weight of a fuel, 25 to 35% by weight of water, 0.01 to 0.5% by weight of emulsifiers (A) and (B) and 0.01 to 0.5% by weight of other additives.

Fuels in the context of the present invention are understood to be any energy-providing fuels of which the free combustion energy is converted into mechanical work. These include all kinds of motor and

aircraft fuels which are liquid at room temperature and normal pressure. Motor fuels, for example for automobile or truck engines, generally contain hydrocarbons, for example gasoline or higher-boiling petroleum fractions. Diesel fuels are obtained from gas oil by cracking or from tars obtained in the low-temperature carbonization of lignitic or hard coal. Typical products have a density of 0.83 to 0.88 g/cm^3, a boiling point of 170 to 360°C and flash points of 70 to 100°C. In the context of the teaching of the present invention, diesel and heating oils are preferred fuels. In the water-fuel mixtures according to the invention, the water content - based on the mixture - is at least 5% by weight and at most 35% by weight. Aqueous mixtures containing about 70% by weight fuel and about 30% by weight water are particularly preferred. The emulsifier system described below is then added to these mixtures in the quantities indicated.

Emulsifier components (A) and (B) are known classes of compounds. Fatty alcohols of component (A) are understood to be fatty alcohols corresponding to formula (I):

$$R^1OH \qquad (I)$$

in which R^1 is a branched hydrocarbon radical containing 12 to 24 carbon atoms and 0 and/or 1, 2 or 3 double bonds. Typical examples are isotridecyl, isohexadecyl, isostearyl or 2-hexyl-1-decane alcohol and 2-octyl decanol and technical mixtures thereof. Branched fatty alcohols of the type under discussion here may be obtained, for example, by standard methods, for example by oxo or Guerbet synthesis. The products of the Guerbet syntheses, which lead to alcohols all branched in the α-position, are preferred alcohols for the purposes of the present invention. Particularly preferred fuels contain branched, saturated C_{14-24} fatty alcohols as component (A).

The compounds of component (B) are also known compounds

obtained by reaction of C_{12-18} fatty alcohols with ethylene oxide under pressure in the presence of acidic or alkaline catalysts. Particulars of the process can be found in **"Surfactants in Consumer Products", Editor J. Falbe, Springer-Verlag, 1987, pages 87 to 93** and the literature cited therein. Suitable fatty alcohol ethoxylates contain 1 to 10 mol ethylene oxide units per mol fatty alcohol. C_{12-18} fatty alcohols containing 1 to 4 mol ethylene oxide per mol fatty alcohol are preferably used as starting products for the ethoxylation. Examples of suitable fatty alcohols are lauryl, myristyl, palmityl or stearyl alcohol. Suitable unsaturated fatty alcohols are, for example, oleyl alcohol and 10-undecen-1-ol. The fatty alcohol ethoxylates may also be present in the fuels according to the invention as mixtures of the various ethoxylates.

In another preferred embodiment, component (A) and component (B) are used in quantity ratios of 1:1 to 1:4. The total quantity of emulsifier components (A) and (B) used is preferably from 0.01 to 5% by weight, more preferably between 0.01 and 2% by weight and most preferably between 0.01 and 1% by weight, based on the quantity of fuel and water.

Besides the above-described emulsifiers (A) and (B), other nonionic emulsifiers known to the expert may be used in small quantities (i.e. about 5 to 10% by weight, based on the quantity of (A) and (B)). In general, however, there is no need for additional emulsifiers, i.e. fuels containing emulsifiers (A) and (B) only will be used.

Besides the emulsifiers (A) and (B), the fuels may contain other additives, preferably corrosion inhibitors, for example quaternized ammonium compounds or carboxylic acid amides and derivatives thereof. Particularly preferred corrosion inhibitors are ethoxylated carboxylic acid amides. Such amides correspond to general formula (II):

$$R^2\text{-CO-NX}R^3 \qquad \text{(II)}$$

in which R^2 is a saturated or unsaturated, linear or branched, optionally cyclic alkyl group containing 1 to 24 carbon atoms, X is a hydrogen atom or a methyl group or a group $-(C_2H_2-O)_n-H$ and R^3 is a group $-(C_2H_2-O)_n-H$ or a group $N-Y-(C_2H_2-O)_m-H$, where Y is a difunctional alkylene group containing 1 to 4 carbon atoms and n and m independently of one another have a value of 1 to 10. The compounds of formula (I) may be obtained by amidation of fatty acids or fatty acid mixtures and subsequent ethoxylation. Suitable fatty acids are octanoic, decanoic, lauric, myristic, palmitic, stearic, behenic, arachic, oleic, erucic, ricinoleic acid or mixtures thereof as found, for example, in coconut oil, palm oil, sunflower oil, safflower oil, soybean oil, castor oil, whale oil, fish oil or tallow. Preferred amides contain 12 to 24 carbon atoms and have been reacted with 0.5 to 5 mol ethylene oxide and preferably with 1 to 3 mol ethylene oxide per mol carboxylic acid amide. It is particularly preferred to use a tall oil fatty acid monoethanolamide containing 1.5 mol ethylene oxide per mol amide. In the production of these compounds, secondary products are formed in addition to the desired reaction products or educts, more particularly ethanolamine, triethanolamine or tall oil fatty acid, remain in the product. Technical mixtures such as these are also part of the disclosure of the present invention.

The emulsifier system according to the invention is added to the fuels in quantities of 0.01 to at most 5% by weight. A water-free additive concentrate containing components (A) and (B) and optionally other additives may advantageously be used for this purpose. Accordingly, the present invention also relates to water-free additive concentrates for water-containing fuels for internal combustion engines containing branched-chain, saturated or unsaturated C_{12-24} fatty alcohols, ethoxylated C_{8-24} fatty alcohols containing 1 to 10 mol ethylene oxide per mol fatty alcohol and ethoxylated carboxylic acid amides. The concentrates according to the invention contain emulsifier component (A) in quanities of 10 to 30% by

weight, emulsifier component (B) in quantities of 30 to 60% by weight and the ethoxylated carboxylic acid amides in quantities of 15 to 30% by weight.

The present invention also relates to a process for the production of water-containing fuels in which an additive concentrate as described above is added to the water-containing fuel, i.e. to the water/fuel mixture, in quantities of 0.01 to 5% by weight, preferably in quantities of 0.01 to 2% by weight and more particularly in quantities of 0.01 to 1% by weight.

Examples

An additive concentrate containing 20% by weight of 2-hexyl-1-decanol, 54% by weight of oleyl/cetyl alcohol x 2 EO and 26% by weight of tall oil fatty acid monoethanolamide x 1.5 EO was prepared and was then added to a mixture of 70% by weight diesel oil and 30% by weight water. The additive concentrate was used in a quantity of 0.1% by weight, based on the quantity of water and diesel oil. After brief stirring, a stable emulsion was formed and could be burned without difficulty in a diesel unit.

The fuel/water mixtures according to the invention are suitable as fuels for combustion engines of all kinds, but preferably for diesel engines, more particularly stationary diesel engines as used for block power stations. By using the fuels according to the invention, it is possible to reduce the emission of particulates and NO_x to below the present and future limits stipulated in "TA Luft" without any adverse effect on the combustion process or the engine. In addition, the fuel mixtures according to the invention are stable in storage, particularly at low temperatures, and may be obtained simply by mechanical mixing of the emulsifier system with the aqueous fuel.

CLAIMS

1. A fuel mixture for internal combustion engines containing combustible hydrocarbons, water and emulsifiers and optionally other additives, characterized in that the emulsifier is a mixture of

(A) branched-chain, saturated or unsaturated C_{12-24} fatty alcohols and

(B) ethoxylated C_{8-24} fatty alcohols containing 1 to 10 mol ethylene oxide per mol fatty alcohol.

2. A fuel mixture as claimed in claim 1, characterized in that the emulsifiers (A) and (B) are present in total quantities of 0.01 to 5% by weight, preferably in total quantities of 0.01 to 2% by weight and more particularly in total quantities of 0.01 to 1% by weight.

3. A fuel mixture as claimed in claim 1 or 2, characterized in that they contain

a) 60 to 95% by weight of fuel,

b) 5 to 35% by weight of water,

c) 0.01 to 5% by weight of emulsifiers,

d) 0 to 2.5% by weight of other additives.

4. A fuel mixture as claimed in claims 1 to 3, characterized in that they contain

a) 65 to 90% by weight of fuel,

b) 25 to 35% by weight of water,

c) 0.01 to 0.5% by weight of emulsifiers,

d) 0.01 to 0.5% by weight of other additives.

5. A fuel mixture as claimed in claims 1 to 4, characterized in that the fuel present is diesel oil.

6. A fuel mixture as claimed in claims 1 to 5, characterized in that corrosion inhibitors are present as other additives.

7. A fuel mixture as claimed in claims 1 to 6, characterized in that ethoxylated carboxylic acid amides are present as corrosion inhibitors.

8. A fuel mixture as claimed in claims 1 to 7, characterized in that the

emulsifiers (A) and (B) are present in a ratio by weight of 1:1 to 1:4.

9. A fuel mixture as claimed in claims 1 to 8, characterized in that the emulsifiers (A) are selected from the group of branched, saturated C_{14-24} fatty alcohols.

10. A fuel mixture as claimed in claims 1 to 9, characterized in that the emulsifiers (B) are selected from the group of ethoxylated C_{12-18} fatty alcohols and 1 to 4 mol ethylene oxide per mol fatty alcohol.

11. A water-free additive concentrate for aqueous fuels for internal combustion engines containing branched-chain, saturated or unsaturated C_{12-24} fatty alcohols, ethoxylated C_{8-24} fatty alcohols containing 1 to 10 mol ethylene oxide per mol fatty alcohol and ethoxylated carboxylic acid amides.

12. A water-free additive concentrate as claimed in claim 11, characterized in that it contains 10 to 30% by weight branched fatty alcohols, 30 to 60% by weight ethoxylated fatty alcohols and 15 to 30% by weight ethoxylated carboxylic acid amides.

13. A process for the production of aqueous fuels, characterized in that the additive concentrate claimed in claim 11 or 12 is added to the aqueous fuels in quantities of 0.01 to 5% by weight.

(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT) VERÖFFENTLICHTE INTERNATIONALE ANMELDUNG

(19) Weltorganisation für geistiges Eigentum
Internationales Büro

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WO 01/07541 A1

(54) **Title:** AQUEOUS FUEL MIXTURE

(54) **Bezeichnung:** WÄSSRIGES KRAFTSTOFFGEMISCH

(57) **Abstract:** The aim of the invention is to substantially reduce the emission of NO_x and soot when diesel oils are burnt. To this end, an emulsifier system is used that contains branched, saturated or unsaturated fatty alcohols with 12 to 24 C atoms and ethoxylated fatty alcohols with 8 to 24 C atoms and 1 to 10 mole ethylene oxide per mole fatty alcohol.

(57) **Zusammenfassung:** Durch Einsatz von Emulgatorsystemen, enthaltend verzweigtkettigen, gesättigten oder ungesättigten Fettalkoholen mit 12 bis 24 C-Atomen und ethoxylierten Fettalkoholen mit 8 bis 24 C-Atomen und 1 bis 10 Mol Ethylenoxid pro Mol Fettalkohol, in wässrigen Dieselölen wird bei der Verbrennung die Emission an NO_x und Russ deutlich verringert.

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DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION

☐ Declaration Submitted with Initial Filing OR ☒ Declaration Submitted after Initial Filing

Attorney Docket Number	H 4043 PCT/US
First Named Inventor	BONGARDT, Frank
COMPLETE IF KNOWN	
Application Number	10/031,690
Filing Date	05/31/2002
Group Art Unit	
Examiner Name	

As a below named inventor, I hereby declare that:
My residence, post office address, and citizenship are as stated below next to my name.
I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

AQUEOUS FUEL MIXTURE

(Title of the Invention)

the specification of which

☐ is attached hereto

OR

☒ was filed on (MM/DD/YYYY) 07/14/2000 as United States Application Number or PCT International Application Number PCT/EP00/06736 and was amended on (MM/DD/YYYY) _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37 Code of Federal Regulations, § 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT International application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY	Priority Not Claimed	Certified Copy Attached? YES	Certified Copy Attached? NO
199 34 689.5	DE	07/23/1999	☐	☐	☒

☐ Additional foreign application numbers are listed on a supplemental priority sheet attached hereto:

I hereby claim the benefit under Title 35, United States Code §119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)	
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I hereby claim the benefit under Title 35, United States Code §120 of any United States application(s), or §365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of Title 35, United States Code §112.1 acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application Number	PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number *(if applicable)*
	PCT/EP00/06736	07/14/2000	

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As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Sole or First Inventor: ☐ A petition has been filed for this unsigned

1-00

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Applicant Authority							

☒ Additional inventors are being named on supplemental sheet(s) attached hereto

DECLARATION

ADDITIONAL INVENTOR(S)
Supplemental Sheet

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Name of Additional Joint Inventor, if any: ☐ A petition has been filed for this unsigned inventor

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Post Office Address							
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